

NOTES ON SOME PARASITES OF VESPA.

Plate I, Figs. 1—13.

By Rev. J. L. ZABRISKIE.

Vespa, from "*vespillio*", the undertaker, whose duty was to carry off the corpse of the poor for burial in the evening, is a very appropriate name for our social wasps, because of their habit of carrying their prey — larvæ and imagines of other insects as food for the young.

These social wasps have three forms in the colony — queens, or developed females; workers, or undeveloped females; and males. The cells of the nest are not used for storing food, but only for rearing the young. The cells vary in size to suit the three forms of the colony, the smallest for the workers being constructed first, and the larger for the females and males being constructed among the last. The cells are hexagonal in form, and arranged closely side by side in the combs, like those of the honey-bee, but with this marked difference. The honey-bee hangs the combs perpendicularly, and has the cells projecting on both sides of the combs horizontally, excepting the queen cells, which are remarkably large and hang downward. The Vespidae arrange the combs horizontally, and have the cells projecting only from the under side, and so, of course, hanging downward perpendicularly and opening at the lower end.

In the collection of the American Museum of Natural History, New York, are two nests of *Vespa maculata* L. with some of the combs attached solidly and vertically to the inner surface of the protective covering, which seem to be abnormal instances.

Polistes attaches these horizontal combs by pedicels to twigs and trunks of trees, under surfaces of stones, and eaves of buildings, but leaves the combs without any protective covering.

The species of *Vespa*, comprising our hornets and yellow-jackets, build their nests in cavities in the ground, in and under stumps, under stones, attached to trunks, limbs and twigs of trees, and under the eaves of buildings. The combs are arranged in horizontal tiers, sometimes as many as eight in number, fastened concentrically, one directly beneath the other, by strong pedicels, leaving a clear passage way between each pair of combs; and, whatever the situation, the series of combs is always entirely enclosed with a protective envelope of paper, ultimately in the

form of an inverted cone, the envelope being composed of many successive slightly separated layers, and the nests which are constructed in the open air having usually only one entrance, somewhere near the lower, pointed extremity of the envelope.

Nests of recent origin are found of only one and one-half inches entire diameter. It is probable that in enlarging such a nest, as the colony increases, this envelope must be removed and reconstructed of continually increasing diameter, until the limit is reached, and it may be that the same paper is worked over a number of times.

I have in my collection a nest of the yellow-jacket one and one-half inches in diameter, and about two inches in length, with one very irregular original comb, and a second incipient comb supported underneath by a slender pedicel. The nest is furnished with three successive concentric sheets of envelope. The innermost of these envelopes is so constructed as to enclose only a few of the cells of the first comb, the others being outside its periphery, although the cells of the first combs are covered by the outer envelope. The innermost envelope is so in the way of the extending comb, and is so irregular in its lower outline that it seems probable that the occupants intended to tear it entirely away, and then to extend the second tier of combs. (Fig. 1.)

The paper employed is weather-beaten wood fibre, torn off and worked up by the mandibles, which are admirably adapted to this purpose. The worker of our spotted hornet, *Vespa maculata* may be seen to tear off with its mandibles from the weather-beaten surface of wood in a few seconds a mass of fibre, which is continually and neatly rolled in a sphere about the size of a No. 4 shot, and held between the flexed anterior legs against the thorax to be carried to the nest.

The wood fibre is evidently moistened with some secretion answering to saliva, and is then worked out into thin, minute sheets of pulp, as these are constantly fastened in place in the construction of the nest. In the substance of the nest one can see these minute sheets in horizontal bands of varying color, showing the varying origin of the material employed.

On December 3d, 1877, at New Baltimore, N. Y., fifteen miles south of Albany, at my request a friend detached from the eaves of his residence and brought to me two nests of the yellow-jacket. These nests, of course, at that season were deserted by the owners,

hence the species was not determined, but it is probable that they both were of *Vespa germanica* Fab.

The first nest was six inches in extreme diameter; contained three tiers of combs; and hibernating within it were 159 living specimens of our common brown wasp, *Polistes metricus* Say. The second nest was eight inches in diameter, with four tiers of combs, and within were 169 living specimens of *Polistes metricus* and eleven large flies.

In the cells of these nests were found living specimens of two hymenopterous parasites, of widely separated genera, and the cocoons of a third hymenopterous parasite, which had issued before examination was made.

The first parasite. In the bottom of some of the vespa cells, which were always open at the lower extremity or entrance, and which evidently had been cleaned out by the workers to this region, was observed a firm, smooth, yellow floor; entirely filling this portion of the vespa cell; firmly adhering to its hexagonal walls; about one-third of the diameter of this floor being occupied with a central, circular, translucent film; this film affording an easy point of exit for the occupant of the otherwise hard mass; and the plane of the floor or outer surface of the yellow mass always lying at an angle of nearly 45° with the axis of the vespa cell. (Fig. 2.)

There were 16 of these yellow masses in the first nest. On extracting one of them it was found to be the cocoon of a hymenopterous parasite; entirely filling the inner portion of the vespa cell for about one-third of its depth; so closely adhering to the walls of the latter that they could not be separated without tearing, and of such unusually hard structure, especially at the outer inclined surface, as to be almost like wood under the knife. The hard yellow walls of these cocoons were formed of a coarse fibred silk, disposed in concentric sheets, slightly separated in the thicker portions of the walls, reminding one of the concentric envelopes of the vespa nest. The cavity of the cocoons was occupied by a closely fitting but easily detachable case, composed of three or four concentric layers of a transparent yellowish substance, like the most delicate mica, but showing no fibrous structure under high magnification. In several instances two of these parasitic cocoons were placed one directly upon the other in one vespa cell. In the first nest were found 16, and in the second nearly 100 of these yellow cocoons. On dissecting one of these cocoons a

perfect, living, female imago was secured, and subsequently a small number, including three males, were reared in confinement.

In the collection of the American Museum of Natural History is a nest of *Vespa maculata* thoroughly infested with this same parasite. This nest I have been permitted to examine through the kindness of the Curator, Mr. Bentenmuller. The only particular point of difference noted is the fact that, the cells of *V. maculata* being much larger than those of the yellow-jacket, the cocoons of the parasite in the museum nest are never superimposed, but very frequently three such cocoons are placed side by side, firmly compacted, in the bottom of one vespa cell.

From information afforded me by Dr. E. B. Southwick he has probably reared the same parasite from the nest of *Polistes metricus* Say.

Through the kindness of Dr. C. V. Riley and Mr. W. H. Ashmead I am informed that this parasite is a Tryphonid, evidently allied to the genus *Sphécophagus* of Westwood. It may be described as follows:

***Sphécophagus* (?) *prædator* sp. nov. (Figs. 5. 6.)**

♀.—Length 7 to 8 mm.; expanse of wings 11 mm. Head sub-quadrate from above, dull black, excepting a narrow stripe around the inner periphery of the eyes, and a triangular patch on the base of the mandibles whitish or light red. Cheeks somewhat gibbous and produced posteriorly, dark red. Mandibles rufous, bidentate, with the teeth dark. Labrum light red. Ocelli large, placed in a close triangle. Antennæ filiform, as long as four-fifths of the entire body, 28-jointed, first joint globular pyriform, third joint slightly longer than the first and second combined, concolorous, light red. Thorax dark red, minutely punctate; collar, posterior margin of the prothorax, and tegulae whitish; parapsidal grooves distinct, converging towards the posterior third of the mesothorax; scutellum prominent, light red, ob-pyriform, posteriorly rounded; postscutellum corrugated at the sides, with black patches; metathorax well produced posteriorly, carinated and areolated. Anterior wings with stigma and parastigma well developed; areolet wanting; both recurrent nervures well bent. Legs concolorous, lighter red than the thorax and abdomen; anterior tibial spine well developed; intermediate and posterior tibiae two-spined. Abdomen a little longer than the head and thorax combined, minutely punctured, lighter red than the thorax, becoming slightly darker towards the apex; first abdominal segment well bent towards the apex, rapidly widening posteriorly for three-quarters of its length, twice as long as wide.

♂.—Length 5.5 mm.; expanse of wings 10 mm. Head black, with broader whitish stripe along inner margin of the eyes; face below the insertion of the antennæ, cheeks and mandibles white. Antennæ 28-jointed, nearly as long as the entire body, under surface of the first joint whitish. Prothorax all whitish except-

ing a black central longitudinal band on each side. Sentellum, abdomen and legs all lighter red, and abdomen narrower than in the ♀.

Described from three ♀♀ and one ♂. Types in my collection.

A second parasite. In one cell of the second vespa nest, collected at New Baltimore, about one hundred pupæ in a moist mass and a few issuing imagines of another much smaller parasite were found. Three of these imagines were secured and mounted in balsam on microscopical slides. The remainder and the pupæ, in some unaccountable manner, were unfortunately lost. The three mounted specimens are all females, and, although distorted by pressure, something of the character can be seen in Fig. 7. One of these slides was submitted to Dr. Riley, who has kindly informed me that it is a Chalcid of the curious genus *Melittobia* or *Anthophorabia*, discussed by Messrs. Ashmead and Howard in Proc. Ent. Soc. Wash., Vol. 11, p. 228—32 and 244—48. The balsam has rendered the specimen somewhat translucent, so that the antennæ are seen at special advantage. The outer four joints are darker than the others, but they show in more remarkable manner than I have ever noticed elsewhere the curious sensory pits and interior lengthened sensory cavities frequently to be seen in hymenopterous antennæ. (Figs. 11, 12.)

In both the nests of *Vespa* collected at New Baltimore there were traces of a third hymenopterous parasite. In the first nest there were thirty-seven vespa cells with the rounded pupal covering still unbroken, but pierced with three or four small circular openings. Inside, corresponding with these small openings, were found soft, silky, white cocoons, undoubtedly hymenopterous, all deserted by their owners, who had evidently made their exit at the corresponding external openings. The second nest contained twenty-five of these pierced vespa cells.

At Nyack, N. Y., early in October, 1883, while examining a nest of *V. maculata*, which had been recently deserted, a small dipterous puparium dropped from one of the cells. (Fig. 13.) And at Flatbush, Long Island, on October 14th, 1892, from a decayed log was extracted a female *V. maculata*, dead and partially dried. On separating the abdominal rings of this female, from the nearly empty abdominal cavity there dropped out a dipterous puparium which is indistinguishable from Fig. 13.

EXPLANATION OF PLATE I.

Fig. 1.—Nest of *Vespa* sp. Portions of two envelopes cut away, showing the innermost envelope in such position that it must be necessarily torn away to enlarge the nest. $\frac{2}{3}$ natural size.

Fig. 2.—Yellow cocoon of the first parasite *in situ*, in a vespa cell.

Fig. 3.—Yellow cocoon extracted.

Fig. 4.—Longitudinal section of a yellow cocoon. Figs. 2—4 all natural size.

Fig. 5.—*Sphécophagus* (?) *predator*. ♀. x 5.

Fig. 6.—The same. ♂. x 5.

Figs. 7, 8, 9.—Mandible and palpi of the same from the left side. x 30.

Fig. 10.—*Melittobia* sp. ♀. x 25.

Fig. 11.—Antenna of the same of the right side. x 75.

Fig. 12.—Antennal club and succeeding joint of the same, showing the sensory hairs and lengthened sensory cavities. x 250.

Fig. 13.—Dipterous puparium from abdominal cavity and cell of *V. maculata*. x 5.



NOTE ON PSEPHENUS LECONTEI Lec.

By CHARLES W. LENG.

This beetle, which has been reported from Niagara Falls and other rocky cataracts, lives also in more placid situations and much nearer to us here in New York. I found it abundant on July 1st, 1893, at Echo or Macopin Lake near Newfoundland, a station on the N. Y., Susquehanna & W. R. R. in Sussex Co., N. J. This lake is an oval sheet of water, lying among the mountains and encircled by forest, in which red-berried elder and the flowering raspberry grow, and minks raise their families of young. The edge of the lake is thickly strewn with fairly large boulders and its clear waters admit of watching the animal life that clings to the rocks below the water line. While thus watching I discovered *Psephenus Lecontei*, slowly walking over the submerged boulders and glistening like silver from the air bubbles contained in its silky covering of hair. Sometimes the walk extended above the surface, but whether above or below the beetles were easily alarmed and made off in short flights like *Elaphrus* or *Bembidium*, demonstrating their indifference to air, rock or water.

The numbers in which they occurred were considerable and I captured perhaps a dozen in a half hour.